




March 30, 2004

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FROM: Don Nelson   
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SUBJECT: Project Delivery Memo #04-02 – Cyclic Density Specification

**Purpose and Direction**

**Background:** In research dating back to 1995, it was determined that hot mix asphalt (HMA) placed with large temperature differentials may have lower density in the areas of low temperature. The result of lower densities is early pavement failure due to fatigue cracking, and raveling.

Infrared video images have been used as tools to help educate paving contractors and inspectors on the problems associated with temperature differentials in the HMA mat, and how to minimize them. For a number of years, regions have included special provisions in paving contracts to require additional equipment in the paving train to provide a degree of mixing or other methods to minimize the large temperature differentials in the HMA mat. The issue of how to deal with the problems of temperature differentials has been discussed at numerous meetings of the WAPA/WSDOT Joint Task Force. A task group of subject matter experts from WSDOT and the paving industry was formed to develop a procedure for an end result density test to identify potential problems that would result in early pavement failure. The test procedure would be in addition to random density testing done for quality assurance. The attached special provision is the product of the WAPA/WSDOT task group.

**Types of Projects Affected:** It is intended that this GSP be used in projects with Hot Mix Asphalt as determined by Region Construction Staff. This specification should be considered for early or late season pavers, projects in mountain passes, night paving, and projects where there may be long hauls involved in bringing material to the job site.

**Direction:** This specification provides a method to measure the end result of the contractor's effort in producing a high-quality, uniformly dense HMA mat. It is a WSDOT Strategic Direction to focus on end product specifications and reduce the number of prescriptive or method specifications that have been a part of the Standard Specifications for many years. It is intended that study and evaluation will continue with the paving industry to monitor the use of this specification and make changes as needed.

**Value in Making the Change:** The cyclic pattern of substandard density areas has led to early pavement failures that require extra maintenance effort. The patterns have been such that they are often missed when performing random density testing, as part of quality assurance. This specification provides a means to identify and measure performance to minimize areas of pavement that may be subject to early failure.

### **Action Requested**

#### **Project Development**

Regions are encouraged to utilize this special provision in hot mix asphalt paving projects that may be paved early or late in the season, where night paving is required, in mountain pass areas, or where there may be long hauls to deliver hot mix to the project site. The decision to use the specification should be made in consultation with the region construction and materials staff.

#### **Contract Ad and Award**

This provision may be added to the contract provisions by addendum, at region request, provided there would be no delay in the bid opening date.

#### **Construction**

No changes are recommended for current contracts, although the procedure may be used at any time as an instructional tool for the inspection staff and the contractor.

Contracts that have this provision included, should expect some degree of increase in work on the part of the HMA street inspector (to identify areas that need to be tested) and the density tester (extra test points may be needed). Digital infrared cameras have been ordered for each region to use as a tool to help identify areas that need to be checked for density. This test procedure does not carry a required frequency of testing. It is to be used as a tool for corrective action to ensure quality pavement. If a contractor is using the proper equipment, and is making use of the best techniques for paving, there may not be a need to invoke this test protocol on the project at all. Without this provision, it is difficult to mandate corrective action, should a problem be discovered.

DN:cd  
KJD/HJP  
Attachment

cc/att: John Conrad  
Tom Baker  
Kevin Dayton  
Harold Peterfeso  
Region Construction Engineers  
Region Material Engineers  
Region Project Development Engineers

## **Cyclic Density GSP**

Section 5-04.3(10)B is supplemented with the following:

The Engineer may also evaluate the HMS for low cyclic density of the pavement. Low cyclic density areas are defined as spots or streaks in the pavement that are less than 89.0 percent of the reference maximum density. If four or more low cyclic density areas are identified in a lot, a cyclic density price adjustment will be assessed for that lot. The price adjustment will be calculated as 15 percent of the unit bid price for the quantity of HMA represented by that lot. Only one area per delivered truck and one area per delivered trailer of HMS will be counted toward the number of low cyclic density areas. Any area tested for density under Section 5-04.3(10)B Control 1. General, will be included in this analysis.